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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
ROYAL LAKE, CALHOUN COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lake data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Royal Lake is a 45 acre Illinois river backwater managed by the Illinois Department of Conservation (IDOC). It is located 4 miles east of Brussels, in Calhoun County, Illinois. It has a maximum depth of 4 feet, an average depth of 2.5 feet, and a storage capacity of 112 acre-feet (Table 1). Royal Lake is one of a number of interconnecting backwaters. Surface area and capacity estimates vary greatly depending on the stage of the river and how the boundaries are defined.

Royal Lake serves as a recreational lake. Waterfowl hunting is a major use; eleven duck blind sites are managed by IDOC. In addition, the lake receives heavy recreational use by fisherman, mushroom and pecan hunters, squirrel hunters and canoeists. Royal Lake is closed to the general public and fisherman during the waterfowl season. The lake is accessible only by boat or canoe from the south end of the lake where it interconnects with Pohlman Slough. There are no roads or foot trails.

The watershed drainage area of Royal Lake is estimated to be 95 percent woodland. The lake shoreline is also primarily wooded.

Suspended sediment, deposition of sediment, aquatic weeds (duckweed) and discarded beverage containers are considered substantial problems for Royal Lake. Algal blooms are considered a moderate problem. Sediment in the lake is cited as a major pollution source. This condition is aggravated by periodic flooding from adjacent Illinois and Mississippi Rivers.

TABLE 1. LAKE ASSESSMENT SUMMARY, ROYAL LAKE, CALHOUN COUNTY, ILLINOIS (SD-B02-0).

I. GENERAL INFORMATION

River Basin: Illinois
Segment: B02

Ownership: Managed by IL. Dept. of Conservation, Region V
Alton, IL

Surface Area (Acres): 40 - 50 (68*)
Watershed Area (Acres): none
Maximum Depth (Feet): 4 (5*)
Average Depth (Feet): 2½ (3*)
Storage Capacity (Acre/Feet): 112.5 (204*)
Inflowing Stream(s): none
Outflowing Stream(s): none
Water Retention Time:
Lake Type: River backwater
Year Constructed: na

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation: moderate
Fishing: heavy
Swimming: none
Power Boating: light
Row Boating or Canoeing: moderate
Sailboating: none
Camping: none
Picnicking: none
Waterfowl Hunting: very heavy
Waterfowl Observation: none
Other:

Recreational Facilities:

11 duck blind sites

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns):
Golf Courses:
Pasture or Grassland:
Woodland: 95%
Row Crops:
Wetland: 5%
Other:

Watershed Usage (Percent):

Urban:
Residential:
Golf Courses:
Pasture or Grassland:
Woodland: 95%
Row Crops:
Wetland: 5%
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair

Fishing: fair

Conditions and Extent:

Suspended Sediment: large (turbidity high year-round)
Deposition of Sediment: large
Algal Blooms: moderate
Aquatic Weeds: large (duckweed)
Taste and/or Odor: slight
Water Level Fluctuation: minimal
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks:
Pasture or Grassland Runoff:
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from
Lawns/Golf Courses:
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake: yes
Other: Carp; Floodwaters of Illinois & Mississippi Rivers

V. LAKE MANAGEMENT

Comments: Extreme shallow water conditions and "mucky"
bottom.

Information Supplied By Mr. Robert Freeman (1981); *Illinois Department of Conservation (1977).

NOTE: Royal Lake is one of a number of interconnecting backwaters. Surface area estimates vary greatly depending how the boundaries are defined and the river stage.

Assessment information on Royal Lake was provided by Robert Freeman and the Illinois Department of Conservation. Monitoring was performed by Robert Freeman and Ken Freeman. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on seven dates in 1981: May 17, June 6 and 28, August 14 and 20 and September 12 and 27.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Royal Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are presented in Table 3, while field observations are summarized in Table 4.

Transparency of Royal Lake

The average Secchi disc transparency of Royal Lake was 7.3 inches. Royal Lake ranked number 87 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Spatial and Seasonal Differences in Transparencies

The Secchi disc transparency of Royal Lake ranged from a minimum of 5 inches at all three sites on September 27 to a maximum of 11 inches at Site 3 on June 6.

Clarity was uniform at the three sites on Royal Lake. Average transparencies were 7.4 inches, 7.0 inches and 7.6 inches at Sites 1, 2, and 3, respectively. The lake was extremely turbid throughout the May - September sampling. The low Secchi readings were related, in part, to the shallow depths of the sites and resultant stirring up of sediment by wind and wave activity. A brown water color and large amounts of suspended sediment were observed on all sampling dates at each of the sites, indicating that the lack of transparency was primarily due to sediment.

FIGURE 1
ROYAL LAKE
CALHOUN COUNTY

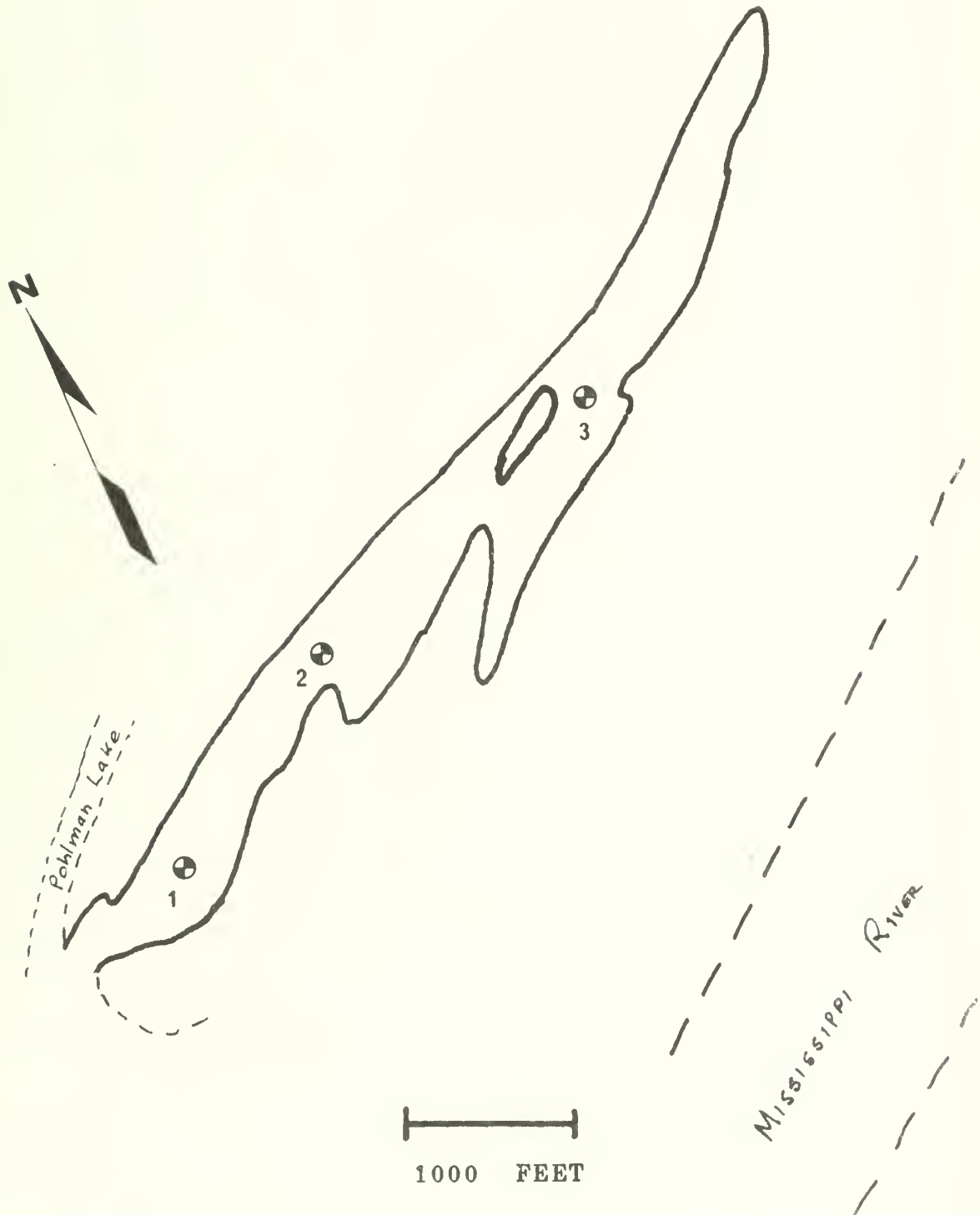


TABLE 2

SECOND DISC TRANSPARENCY INCHES ROYAL/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/17	0.0	0.0	0.0	0.7	0.6
06/06	1.0	0.0	1.0	0.7	1.5
06/20	0.0	0.0	0.0	0.0	0.0
08/14	0.0	0.0	0.0	0.0	0.0
08/20	0.0	0.0	0.0	0.0	0.0
09/12	0.0	0.0	0.0	0.0	0.0
09/27	0.0	0.0	0.0	0.0	0.0

SUMMARY STATISTICS

LAKE

SITES

MEAN	7.4	7.0	7.6	7.3
STD DEV	1.8	1.3	2.1	1.7
MIN	0.0	0.0	0.0	0.0
MAX	1.0	1.0	1.0	1.0
AV DEPTH	2.0	2.1	3.0	3.0

-1 = missing value

See glossary for explanation of Summary Statistics

TABLE 3

DEPTH OF SITE (FEET) ROYAL/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/17	3.0	2.0	3.0	2.7	0.6
06/06	3.0	2.0	3.0	2.7	0.6
06/20	4.5	4.0	5.0	4.5	0.5
08/14	2.5	2.0	2.5	2.3	0.3
08/20	2.5	2.0	3.0	2.5	0.5
09/12	2.0	1.5	2.5	2.0	0.5
09/27	2.0	1.0	2.0	1.7	0.6

SUMMARY STATISTICS

LAKE

SITES

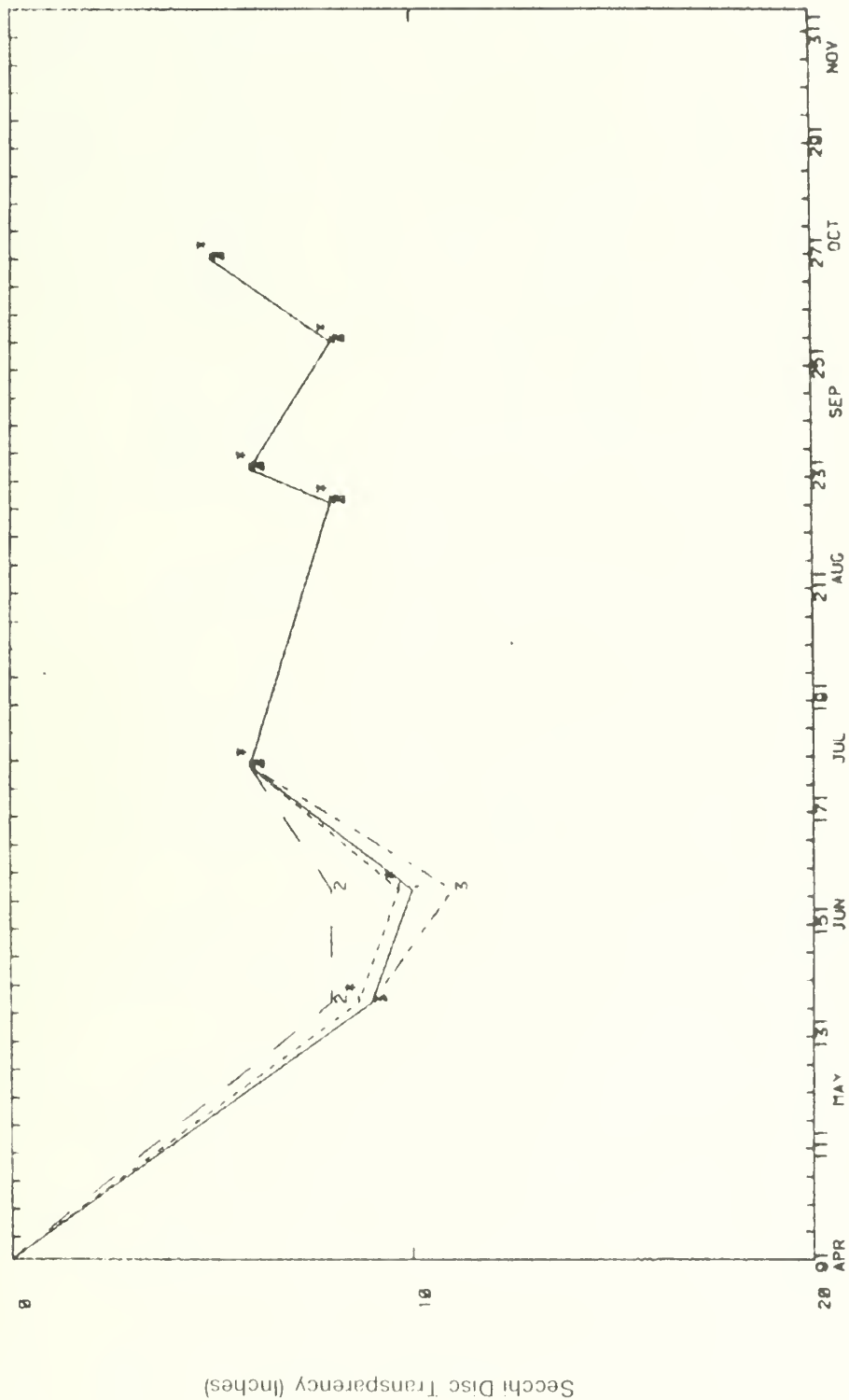
MEAN	2.8	2.1	3.0	2.6
STD DEV	0.0	0.0	1.0	1.0
MIN	2.0	1.0	2.0	1.0
MAX	4.5	4.0	5.0	5.0
AV DEPTH	2.8	2.1	3.0	3.0

-1 = missing value

See glossary for explanation of Summary Statistics

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) ROVAL/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA '98')



KEY
 1 Site 1
 2 Site 2
 3 Site 3
 . Mean (Average)

Day of Year

TABLE 4. FIELD OBSERVATIONS, ROVAL LAKE, CALHOUN COUNTY, ILLINOIS

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/1/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal large none no odor	orange-brown large minimal minimal slight none no odor	lt. brown large minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast v. lt. rain calm warm W Robert H. Freeman Ken Freeman	clear no rain ripple warm W	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
								above normal none none none
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal large none no odor	lt. brown large minimal minimal slight * no odor	lt. brown large minimal minimal minimal * no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	hazy no rain calm warm none Robert H. Freeman Ken Freeman	hazy no rain calm warm none	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
								normal fishing none none
*heavy concentration of cottonwood "cotton" beverage containers								
-7-								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	very brown large minimal minimal large none no odor	very brown large minimal minimal moderate none no odor	very brown large minimal minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain ripple hot N Robert H. Freeman Ken Freeman	clear no rain ripple warm N	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
								above normal 18-24" fishing, row boating, camping none Heavy rains in last 2 wks. both locally & upriver have caused overflow of Ill. R. backwards into lake.
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal moderate none no odor	lt. brown large minimal minimal moderate none no odor	lt. brown large minimal minimal slight waterfowl no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	hazy no rain calm hot S Robert H. Freeman Ken Freeman	clear no rain calm hot S	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
								normal fishing hot none none

TABLE 4. FIELD OBSERVATIONS, ROYAL LAKE, CALHOUN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/20/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal moderate none no odor	lt. brown large minimal moderate waterfowl no odor	lt. brown large minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm warm none	overcast heavy rain moderate warm NE Robert H. Freeman Ken Freeman	WATER LEVEL OF LAKE: RECREATIONAL USAGE: canoeing normal fishing, none LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal moderate duckweed no odor	lt. brown large minimal moderate none no odor	lt. brown large minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot N Robert H. Freeman Ken Freeman	clear no rain ripple hot N	WATER LEVEL OF LAKE: RECREATIONAL USAGE: normal fishing none LAKE MANAGEMENT: ADDITIONAL COMMENTS:

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DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/27/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal moderate none no odor	lt. brown large minimal moderate waterfowl no odor	lt. brown large minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm warm none	overcast heavy rains moderate warm NE Ken & Robert Freeman	WATER LEVEL OF LAKE: RECREATIONAL USAGE: normal fishing & canoeing none LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Royal Lake (estimated at twice the Secchi depth) ranged from 0.8-1.7 feet at Site 1, from 0.8-1.3 feet at Site 2, from 0.8-1.8 feet at Site 3. Since Royal Lake is so shallow the bottom waters probably contain sufficient amounts of dissolved oxygen from mixing due to wind and wave activity.

SUMMARY AND RECOMMENDATIONS

Summary

Royal Lake, a very shallow Illinois River backwater in south-central Illinois, was sampled on seven dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Ken and Robert Freeman recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Royal Lake (7.3 inches) ranked 87th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, and is in the range generally associated with use impairment problems in Illinois lakes. However, the backwater is heavily used, primarily as a waterfowl hunting area.

Continued monitoring is recommended for Royal Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

REFERENCES

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Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen -- Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 6000C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

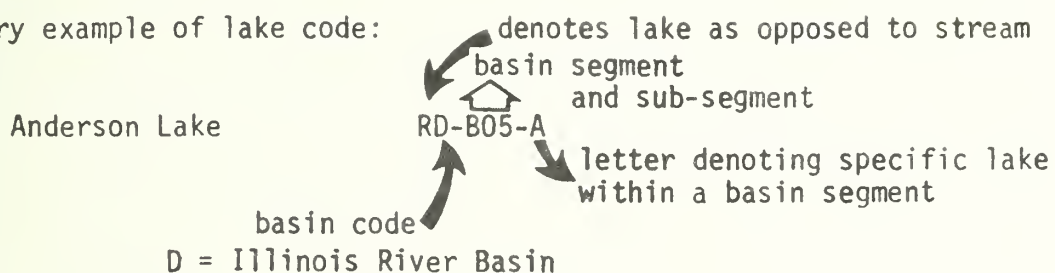
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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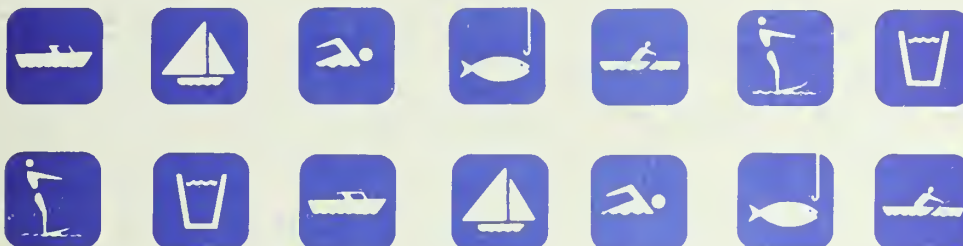
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Nat. Hist. Surv

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706



1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

AUG 21 1981

11RD000



Raccoon Lake / Marion Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
RACCOON LAKE, MARION COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Raccoon Lake is a 763 acre impoundment owned by the City of Centralia, located in Marion County, Illinois. The lake, which was constructed by damming Raccoon Creek in 1943, has a maximum depth of 16 feet, an average depth of 6 feet, and a storage capacity of 4578 acre-feet (Table 1).

Raccoon Lake serves as a potable water supply for the City. Major recreational uses associated with the lake are fishing, power boating, row boating or canoeing, camping and picnicking. Access is unlimited and free.

The 30,974 acre watershed of Raccoon Lake is estimated to be 50% row crops. The lake shoreline is primarily residential.

Deposition of sediment and water level fluctuations are considered substantial problems, while suspended sediment, algal blooms, aquatic weeds, and taste and odor are considered moderate problems for Raccoon Lake. Cropland runoff, pasture or grassland runoff, fertilizer or pesticides from lawns/golf courses and sediment in the lake are cited as the major pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, RACCOON LAKE, MARION COUNTY, ILLINOIS (RP-A02-K).

I. GENERAL INFORMATION

River Basin: Kaskaskia
Segment: A02

Ownership: City of Centralia

Surface Area (Acres): 763
Watershed Area (Acres): 30,974*
Maximum Depth (Feet): 16
Average Depth (Feet): 6
Storage Capacity (Acre/Feet): 4,578
Inflowing Stream(s): Raccoon Creek
Outflowing Stream(s): Raccoon Creek
Water Retention Time: 0.197* yr.
Lake Type: dammed stream
Year Constructed: 1943

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: very heavy
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation: moderate
Fishing: moderate
Swimming: light
Power Boating: moderate
Row Boating or Canoeing: moderate
Sailboating: light
Camping: moderate
Picnicking: moderate
Waterfowl Hunting: light
Waterfowl Observation: light
Other:

Recreational Facilities:

picnic area, campgrounds, &
boat launch

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns): 50%
Golf Courses: 5%
Pasture or Grassland:
Woodland: 40%
Row Crops:
Wetland: 5%
Other:

Watershed Usage (Percent):

Urban:
Residential:
Golf Courses:
Pasture or Grassland: 20%
Woodland: 30%
Row Crops: 50%
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair

Fishing: good

Conditions and Extent:

Suspended Sediment: moderate
Deposition of Sediment: large
Algal Blooms: moderate
Aquatic Weeds: moderate
Taste and/or Odor: moderate
Water Level Fluctuation: large
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks:
Pasture or Grassland Runoff: yes
Cropland Runoff: yes
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from
Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake: yes
Other:

V. LAKE MANAGEMENT

Comments: Treat with copper sulfate each month
to kill algae.

Information Supplied By Kenneth Oestreich (1981); * Illinois State Water Survey (1959).

Assessment information on Raccoon Lake was provided by Kenneth Oestreich, the Water Treatment Superintendent. Monitoring was performed by Gerald Sanders and Arthur Yoos. Secchi disc depth, total depth, field observations were recorded at three lake sites (located in Fig. 1) on nine dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Raccoon Lake are summarized in Table 2 and plotted in Fig. 2. (Due to computer program limitations, the November 2 sampling data would not be included in the tables and graphs.) Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Raccoon Lake

The average Secchi disc transparency of Raccoon Lake was 13.6 inches, which ranked number 74 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and in the range generally associated with use impairment problems for Illinois lakes.

A lengthy drought preceded the 1981 sampling. Thus, the water level of Raccoon Lake was 5 to 5.5 ft. below normal in April and May, leaving Site 3 dry. This site was not sampled until July after heavy rain had brought the water level of the reservoir back to normal.

Spatial and Seasonal Differences in Transparency

The Secchi transparency of Raccoon Lake ranged from a maximum of 30 inches at Site 1 on August 3 to a minimum of 4 inches at Site 2 on May 11 and Site 3 on October 19.

As is typical of Illinois reservoirs, a spatial trend of increasing transparency from the lake headwaters to the dam was apparent in Raccoon Lake. The average transparencies of Sites 3, 2, and 1 were 19.5, 11.6 and 7.4 inches, respectively. The lake was extremely turbid throughout the April-October sampling.

FIGURE 1

RACCOON LAKE

MARION COUNTY

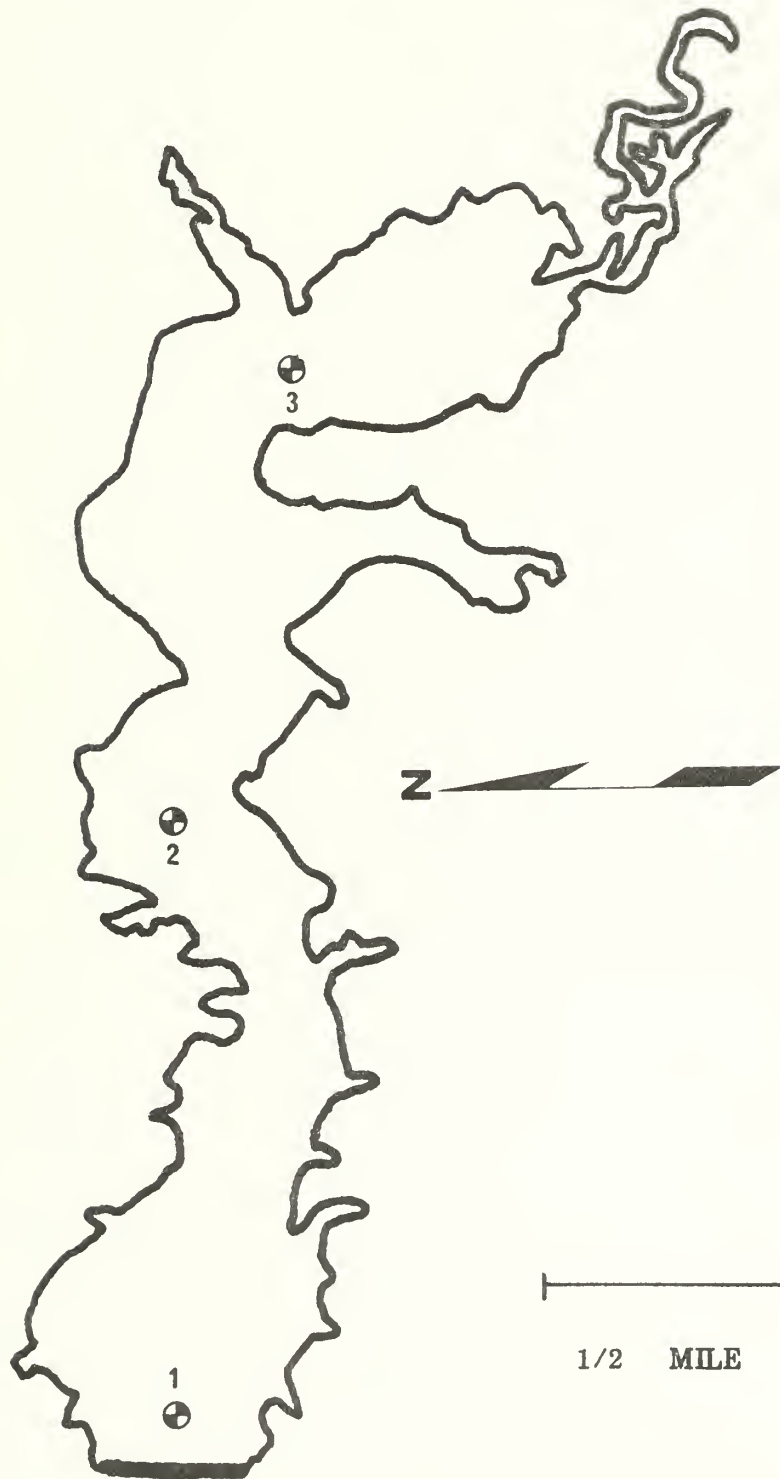


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) RACCOON/MARION COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 27	12.0	10.0	-1.0	11.0	1.4
05/ 11	12.0	4.0	-1.0	8.0	5.7
06/ 8	14.0	10.0	-1.0	12.0	2.8
07/ 6	24.0	14.0	11.0	16.3	6.8
08/ 3	30.0	14.0	8.0	17.3	11.4
08/ 31	24.0	16.0	6.0	15.3	0.0
09/ 21	20.0	15.0	8.0	14.3	6.0
10/ 19	20.0	10.0	4.0	11.3	8.1

SUMMARY STATISTICS

SITES	LAKE
MEAN	19.5
STD DEV	6.5
MIN	12.0
MAX	30.0
AV DEPTH	13.1

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) RACCOON/MARION COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 27	0.0	2.5	-1.0	0.0	4.0
05/ 11	10.0	3.0	-1.0	6.5	4.0
06/ 8	14.0	4.0	-1.0	9.0	7.1
07/ 6	14.0	6.0	4.0	8.2	5.1
08/ 3	14.0	5.0	3.5	7.5	5.7
08/ 31	14.0	5.0	3.0	7.3	5.0
09/ 21	14.0	6.0	4.0	8.0	5.3
10/ 19	15.0	6.0	4.0	8.3	5.0

SUMMARY STATISTICS

SITES	LAKE
MEAN	13.1
STD DEV	2.1
MIN	0.0
MAX	15.0
AV DEPTH	13.1

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) RACCOON/MARION COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

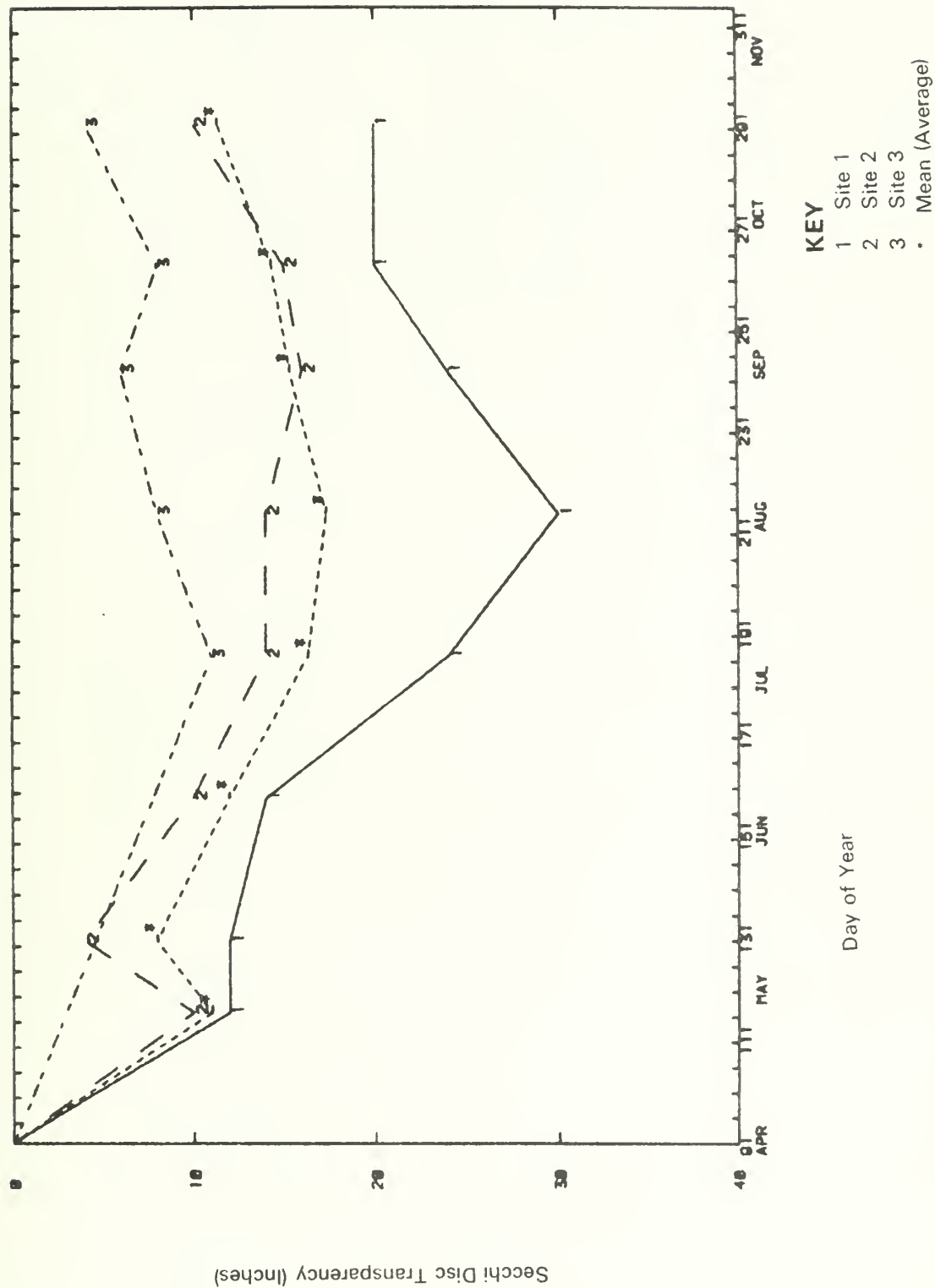


TABLE 4. FIELD OBSERVATIONS, RACCOON LAKE, MARION COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE			WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
4/27/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown moderate slight minimal minimal none musty	very brown	minimal slight none musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm W-NW	clear no rain ripple warm W-NW	WATER LEVEL OF LAKE: below normal 68" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS: This is first time test has been taken, therefore above item has not been filled in
5/11/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	very brown slight minimal minimal minimal none no odor	very muddy large minimal minimal slight none musty	minimal slight none musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain moderate cool WNW	overcast heavy rain moderate cool NNW	WATER LEVEL OF LAKE: below normal 60" RECREATIONAL USAGE: none LAKE MANAGEMENT: 4/27/81 10-100# bags copper sulphate added for algae control ADDITIONAL COMMENTS:
6/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown moderate slight minimal moderate none no odor	mod. brown moderate slight minimal moderate sediment musty	mod. brown moderate slight minimal moderate sediment musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain white caps hot W-SW	clear v. lt. rain moderate hot S	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: Copper sulfate for algae control ADDITIONAL COMMENTS:
7/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal moderate none no odor	lt. brown minimal minimal minimal moderate none no odor	lt. brown minimal minimal minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain calm warm NW-5mph	many clouds lt. rain small warm N-10mph	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: copper sulfate 1500 lbs. for algae control ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, RACCOON LAKE, MARION COUNTY, ILLINOIS.

DATE	OBSERVATION	PRECEDING 24 HOURS			OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	
8/3/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal none	mod. brown slight minimal minimal slight none	very brown slight minimal minimal moderate none	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: 7/20/81 copper sulfate for algae control ADDITIONAL COMMENTS:
			WEATHER AT LAKE CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	PRESENT hazy no rain ripple hot W	
		OBSERVATIONS MADE BY: Arthur Yoos			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal moderate none no odor	1t. brown minimal minimal minimal moderate none fishy	1t. brown minimal minimal minimal moderate none fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm N-NW	few clouds no rain ripple warm N-NW	WATER LEVEL OF LAKE: below normal 3" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: 9/7/81 1500 lbs. copper sulfate for algae control ADDITIONAL COMMENTS:

-8-

DATE	OBSERVATION	SITE			PRECEDING 24 HOURS			OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT		
10/19/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn minimal minimal minimal none no odor	grnsh-brn minimal minimal minimal none no odor	lt. brown* slight minimal minimal slight leaves** no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain small cool W.N.W.	many clouds lt. rain small warm S.	WATER LEVEL OF LAKE: above normal 2½" RECREATIONAL USAGE: fishing, Fed. fisherman on lake (3 or 4 boats) LAKE MANAGEMENT: 9/12/81 1500# CUS04 for algae control ADDITIONAL COMMENTS:

* At #3 location the color of water was due to fairly heavy rain, almost 3", approx. 48 hrs. prior to testing. There were clouds of muddy water "rolling" in this area due to runoff from surrounding fields, etc.

sticks, weeds, etc.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
11/2/81	WATER COLOR; SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown minimal minimal minimal minimal none no odor	1t. brown minimal minimal minimal slight refuse musty	1t. brown minimal minimal minimal slight refuse musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple warm S.-S.E.	many clouds 1t. rain small warm S.	WATER LEVEL OF LAKE: RECREATIONAL USAGE: 2 or 3 boats on lake LAKE MANAGEMENT: none ADDITIONAL COMMENTS: none

Field observations indicated that the lack of transparency was primarily due to sediment, particularly at Site 3. Clouds of muddy water were noticed at Site 3 after heavy rains, indicating that a large amount of sediment (with associated plant nutrients and other pollutants) was entering the lake from the tributary stream. This sediment load appeared to settle out in the upper end of the lake so that the water became clearer towards the dam. As the suspended sediment settled out, algae appeared to become more of a problem, as evidenced by a greenish-brown water color at Site 1 and the routine treatment of the lake with copper sulfate for algal control.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Raccoon Lake (estimated at twice the Secchi depth) ranged from 2-5 feet at Site 1, 0.5-2.5 feet at Site 2, and 0.5-2 feet at Site 3. Since Site 1 on Raccoon Lake is deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese are released from the sediments and accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When substances which have accumulated in the bottom waters are distributed throughout the lake during mixing periods, they can also trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Raccoon Lake, a large, shallow public water supply impoundment in south-central Illinois, was sampled on nine dates between April 27 and November 2, 1981 under the Illinois EPA's Volunteer Lake Monitoring

Program. Volunteers Gerald Sanders and Arthur Yoos recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Raccoon Lake (13.6 inches) ranked 74th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems.

Site 1 on Raccoon Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Raccoon Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from urban storm drainage and fertilization of lawns should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, help to alleviate taste and odor problems, and improve fishing.

Continued monitoring is recommended for Raccoon Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3903C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

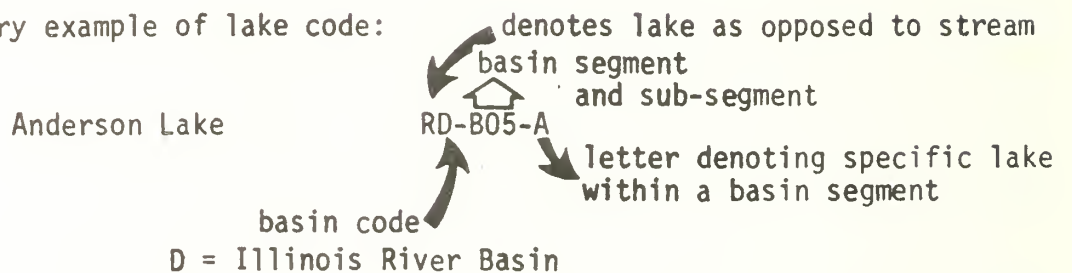
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

DS:sp,6207a,1-8

UNIVERSITY OF ILLINOIS-URBANA
551 482V889X C002
VOLUNTEER LAKE MONITORING PROGRAM SPRIN
1981:59



3 0112 017525889

551.482
V889x
1981:58
cop. 2

Nat. Hist. Serv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706



1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT



POTOMAC LAKE / LAKE CO.

NATURAL RESERVE SURVEY
AUG 20 1982
J. DODD

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
POTOMAC LAKE, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data from the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Potomac Lake is a 14 acre lake that is located in Lake County near Lindenhurst, Illinois. It is owned by the developer, who is now in the process of turning it over to the Village of Lindenhurst. The lake was constructed by damming a marsh in 1975-1976 (Table 1).

Potomac Lake serves as a recreational lake. Waterfowl observation and scenic viewing are its major uses. Access is unlimited and free.

Potomac Lake's watershed is estimated to be entirely residential. The lake shoreline is also primarily residential.

Deposition of sediment and aquatic weeds are considered substantial problems, while water level fluctuation is considered a moderate problem on Potomac Lake. Urban storm drainage, pasture or grassland runoff, construction site runoff, fertilizer or pesticides from lawns/golf courses, waterfowl and sediment in the lake are cited as potential pollution sources.

Assessment and monitoring information for Potomac Lake was provided by Curt Contreras. Secchi disc depths, total depths, and field observations were recorded at three sites (located in Figure 1) on twelve days in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, POTOMAC LAKE, LAKE COUNTY, ILLINOIS (RG-B02ZK).

I. GENERAL INFORMATION

River Basin: Des Plaines
Segment: B02

Ownership: Developer in process of turning it over
to Village of Lindenhurst

Surface Area (Acres): 14
Watershed Area (Acres):
Maximum Depth (Feet):
Average Depth (Feet):
Storage Capacity (Acre/Feet):
Inflowing Stream(s): none
Outflowing Stream(s):
Water Retention Time:
Lake Type: dammed marsh
Year Constructed: 1975 - 76

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation:
Fishing: light
Swimming: none
Power Boating: none
Row Boating or Canoeing: light
Sailboating: none
Camping: none
Picnicking: light
Waterfowl Hunting: none
Waterfowl Observation: heavy
Other: scenic - very heavy

Recreational Facilities:
none

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns): 70%
Golf Courses:
Pasture or Grassland:
Woodland:
Row Crops:
Wetland: 1%
Other: park 29%

Watershed Usage (Percent):

Urban:
Residential: 100%
Golf Courses:
Pasture or Grassland:
Woodland:
Row Crops:
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair

Fishing: poor

Conditions and Extent:

Suspended Sediment: slight*
Deposition of Sediment: large
Algal Blooms: slight
Aquatic Weeds: large
Taste and/or Odor: minimal
Water Level Fluctuation: moderate
Fishkills: slight
Other:

*when rains inflow spots send out large amount of sediment.

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

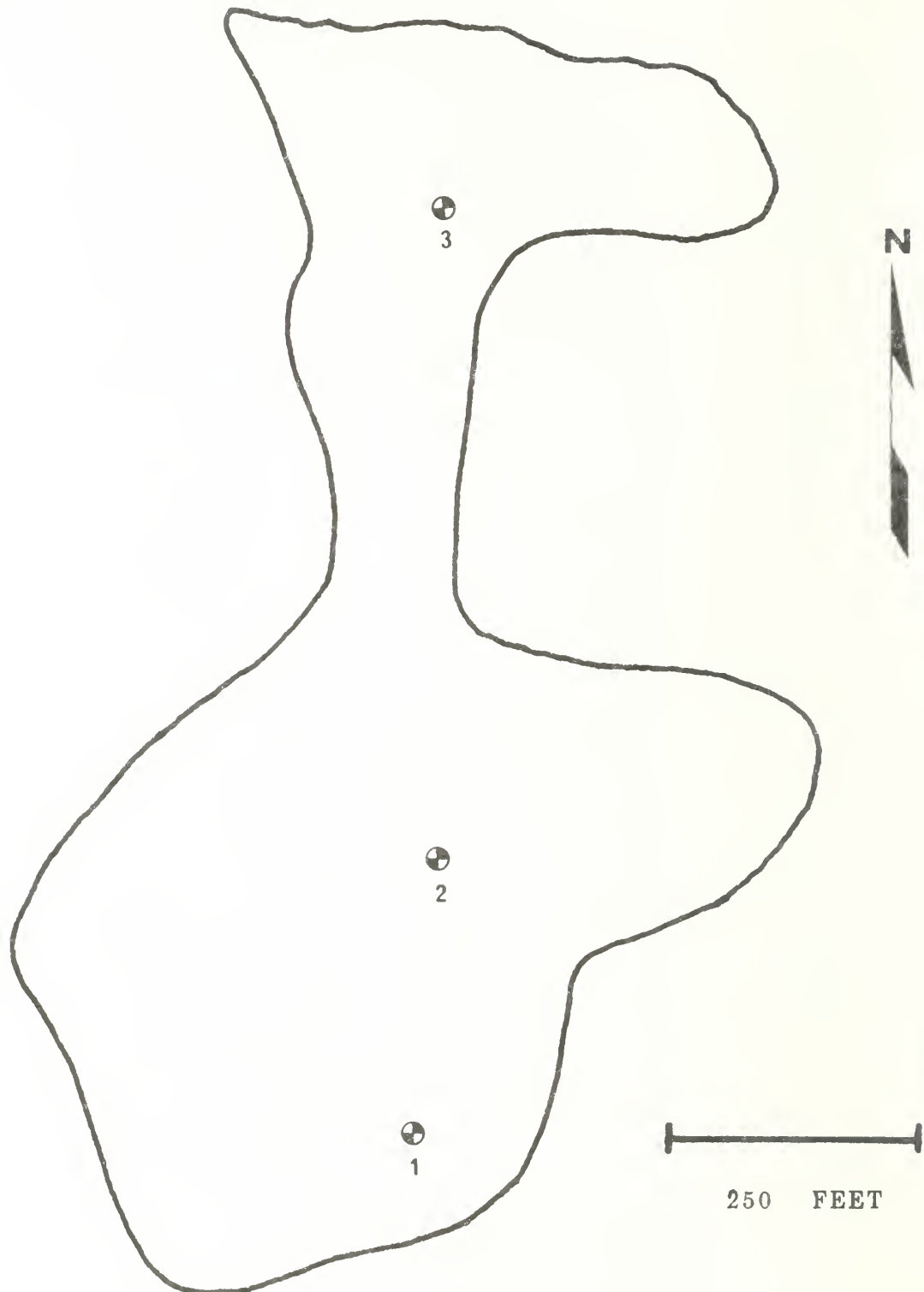
Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage: yes
Septic Tanks:
Pasture or Grassland Runoff: yes
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff: yes
Fertilizer or Pesticides from
Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl: yes
Sediment in Lake: yes
Other:

V. LAKE MANAGEMENT

Comments: 7/79 - Chemicals sprayed over whole lake
to control weed growth. 8/80 - Lake was dredged
along 75% of shoreline because developer had filled
in huge portion of wetlands; large parts of surrounding
land without vegetative cover.

Information Supplied By Curt J. Contreras (1981)

FIGURE 1
POTOMAC LAKE
LAKE COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Potomac Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Potomac Lake

The average Secchi disc transparency of Potomac Lake was 19.1 inches. Potomac Lake ranked number 65 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems in Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Potomac Lake ranged from a minimum of 6 inches at Sites 1 and 3 on August 15 to a maximum of 44 inches at Site 3 on October 31. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

The clarity of Potomac Lake was relatively uniform at the three sites. Transparencies averaged 18.8 inches at Sites 1 and 2, and 19.7 inches at Site 3. The low Secchi readings were probably due, in part, to the shallow depths of the sites (average depth 3.9 feet), and resultant stirring up of sediment by wind and wave activity. It may also reflect a fairly high nutrient content in the lake which promotes the growth of algae and aquatic weeds.

There were seasonal differences in the transparency of Potomac Lake. Lowest transparencies were recorded throughout the summer months and were probably the result of algal blooms. Large amounts of aquatic weeds were observed during the sampling period. In September the whole lake was sprayed with 2-4-D for aquatic weed control, and in October a mechanical weed harvester was used.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) POTOMAC/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 6	30.0	33.0	30.0	31.0	1.7
05/ 28	42.0	20.0	16.0	26.0	14.0
06/ 15	20.0	16.0	16.0	17.3	2.3
06/ 29	12.0	14.0	12.0	12.7	1.2
07/ 13	8.0	12.0	10.0	10.0	2.0
07/ 31	8.0	8.0	8.0	8.0	0.0
08/ 15	6.0	6.0	6.0	6.7	1.2
08/ 31	10.0	11.0	10.0	10.3	0.6
09/ 15	20.0	22.0	20.0	23.3	4.2
09/ 30	20.0	24.0	26.0	23.3	3.1
10/ 15	24.0	26.0	30.0	26.7	3.1
10/ 31	26.0	32.0	44.0	34.0	9.2

SUMMARY STATISTICS

SITES	LAKE
MEAN	18.8
STD DEV	10.7
MIN	6.0
MAX	44.0
AV DEPTH	3.8

-1 = missing value

See glossary for explanation of Summary Statistics. TABLE 3

DEPTH OF SITE (FEET) POTOMAC/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 6	3.5	3.0	3.5	3.3	0.3
05/ 28	4.0	3.5	3.5	3.7	0.3
06/ 15	4.5	3.5	4.0	4.0	0.5
06/ 29	4.5	3.5	4.0	4.0	0.5
07/ 13	4.0	4.0	4.0	4.0	0.0
07/ 31	4.0	4.0	4.0	4.0	0.0
08/ 15	4.0	4.0	4.0	4.0	0.0
08/ 31	4.0	4.0	4.0	4.0	0.0
09/ 15	4.0	4.0	4.0	4.0	0.0
09/ 30	4.0	4.0	4.0	4.0	0.0
10/ 15	4.0	4.0	4.0	4.0	0.0
10/ 31	4.0	4.0	4.0	4.0	0.0

SUMMARY STATISTICS

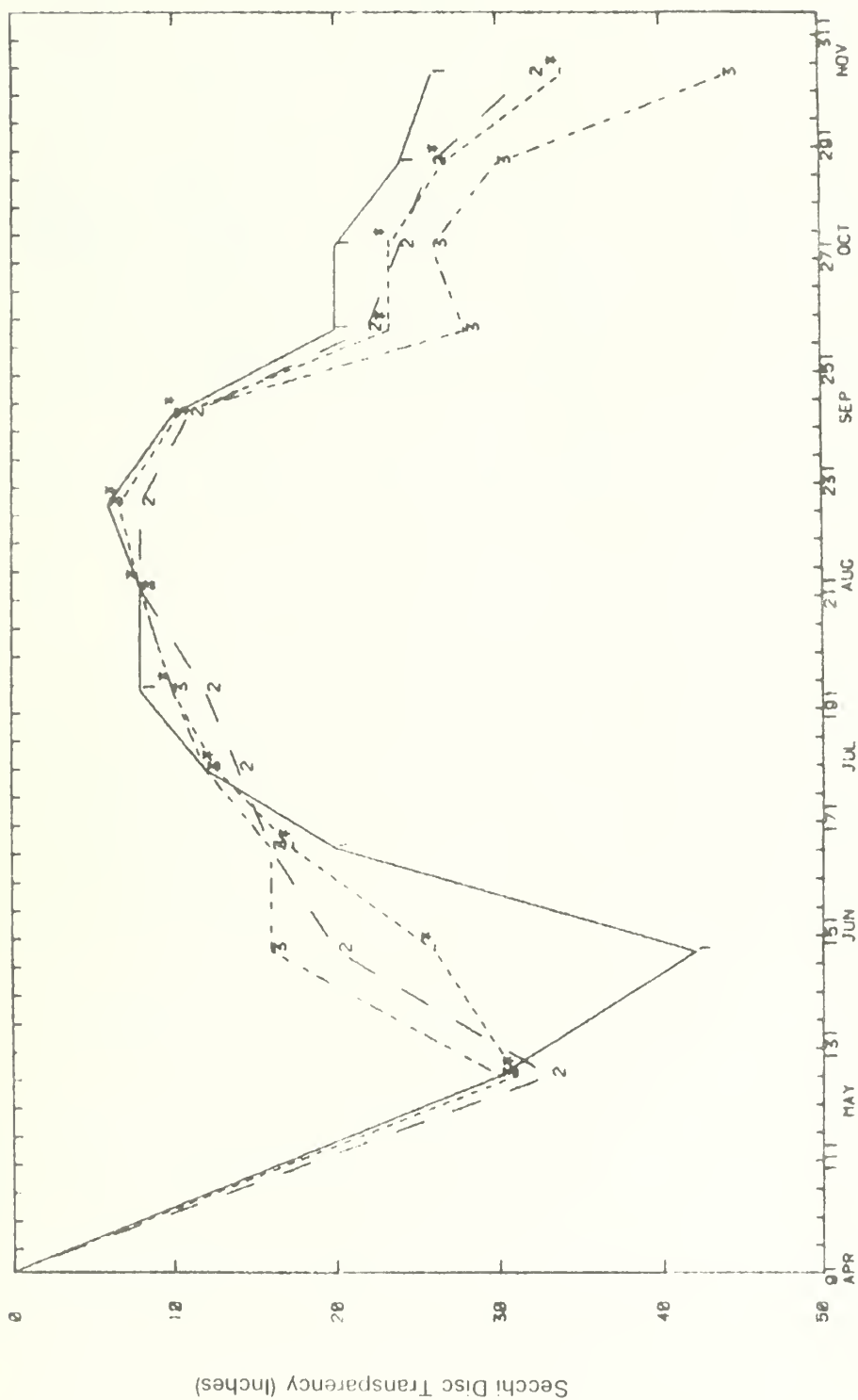
SITES	LAKE
MEAN	4.0
STD DEV	0.3
MIN	3.5
MAX	4.5
AV DEPTH	3.8

-1 = missing value

See glossary for explanation of Summary Statistics

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) POTOMAC/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA '0811)



KEY
 1 Site 1
 2 Site 2
 3 Site 3
 . Mean (Average)

Day of Year

TABLE 4. FIELD OBSERVATIONS, POTOMAC LAKE, LAKE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large none no odor	clear minimal minimal large large waterfowl no odor	clear minimal minimal large large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Curt J. Contreras	clear no rain small cold NW	overcast lt. rain white caps cold NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large algal mats no odor	clear minimal minimal large large algal mats no odor	clear minimal minimal large large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Curt J. Contreras	hazy no rain calm warm none	few clouds no rain ripple warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: Lake was treated with granulated chemical released from helicopter ADDITIONAL COMMENTS: Mosquito abatement program

*duckweed, waterfowl

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal slight large large detritus no odor	clear minimal slight large large waterfowl no odor	clear minimal slight large large large no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Curt J. Contreras	many clouds no rain calm warm SW	overcast mod. rain ripple warm W	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: 6/12/81 Lake was treated with dry pellet insecticide dropped from helicopter. ADDITIONAL COMMENTS: mosquito abatement

*algal mats, duckweed

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large large no odor			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Curt J. Contreras	many clouds no rain ripple warm W	overcast lt. rain small warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: Lake is getting very weedy. Besides cattails showing more & more other types of weeds are appearing on top of lake

*dead fish, algal mats, duckweed

TABLE 4. FIELD OBSERVATIONS, POTOMAC LAKE, LAKE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE			WEATHER AT LAKE		PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT			
7/13/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large detritus* duckweed no odor	clear slight minimal large large * waterfowl no odor	clear slight minimal large large * duckweed waterfowl no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain calm hot none	overcast heavy rain ripple hot W	WATER LEVEL OF LAKE: above normal 1-2" RECREATIONAL USAGE: bird watching LAKE MANAGEMENT: Between 7/2 & 7/7/81 part of lake treated to kill cattails. ADDITIONAL COMMENTS: Weeds are extremely thick. Hard to get boat through. Secchi gets covered up in weeds right away.

*algal mats

DATE	OBSERVATION	SITE			WEATHER AT LAKE		PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3		PRESENT		
7/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large * ** no odor	clear minimal minimal large large * ** waterfowl no odor	clear minimal minimal large large * ** waterfowl no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain calm hot W	clear no rain ripple hot SW OBSERVATIONS MADE BY: Curt J. Contreras	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS: Weeds are so thick on top that its still very hard to get the boat through

*water is covered in large spots by some type of thick floating weed. It has a light green and yellow color to it.

****algal mats, duckweed**

DATE	ALGAL MATS, DUCKWEED					
	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRECEDING 24 HOURS
8/15/87	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES:	clear minimal slight large large *	clear minimal slight large large algal mats waterfowl	clear minimal slight large large algal mats duckweed	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast heavy rain small cool E
	ODOR:	no odor	no odor	no odor	many clouds no rain calm warm W	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT:
				OBSERVATIONS MADE BY: Curt J. Contreras		above normal 1" birdwatching none ADDITIONAL COMMENTS: Lake was extremely stirred up around edges. Water all along edge was muddy looking.

*detritus, algal mats, waterfowl

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
3/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large oil films detritus no odor	clear minimal minimal large large * no odor	clear minimal minimal large large ** no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast lt. rain calm warm E	many clouds no rain calm hot W	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: Floating weeds are slowly going under the surface.

*¹ mats, duckweed, ² terfowl
critus, oil films, ³ terfowl,

TABLE 4. FIELD OBSERVATIONS, POTOMAC LAKE, LAKE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal large large *	clear minimal minimal large large *	clear minimal minimal large large dead fish sediment * no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain calm warm SW	many clouds no rain ripple warm E	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY:	Curt J. Contreras		normal fishing, row boating, bird watching none Sub-Div. builder is looking into obtaining someone to do spraying & weed harvesting on lake.
*algal mats, waterfowl								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal moderate moderate detritus, waterfowl no odor	clear minimal minimal moderate moderate detritus, waterfowl no odor	clear minimal minimal moderate moderate detritus no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain ripple cool W.	many clouds v.l.t. rain ripple cool N.E.	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY:	Ed Endicott for C.J. Contreras		normal none Between 21st. and 25th of September While lake sprayed with 2-4-D to kill cattails and other weeds.
* clumps of sediment, waterfowl								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal moderate minimal detritus* no odor	clear minimal minimal moderate moderate refuse, waterfowl no odor	clear minimal minimal moderate moderate refuse no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple cool E.	few clouds no rain ripple cool E.	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY:	Ed Endicott for C.J. Contreras		normal none Cattails from spraying are all brown and starting to fall over.
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal moderate minimal detritus* no odor	clear minimal minimal slight minimal detritus* no odor	clear minimal minimal slight detritus, waterfowl no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple warm S.	overcast no rain calm warm S.W.	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY:	Curt J. Contreras		normal row boating/canoeing, walking around lake 10/19 - 10/30 * A mechanical & Harvester was brought in and went over the whole lake to remove as many weeds as possible. Weeds were cut 12" below the surface.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Potomac Lake (estimated at twice the Secchi depth) ranged from 1.0-7.0 feet at Site 1, from 1.3-5.5 feet at Site 2, from 1.0-7.3 feet at Site 3. Because of the shallow nature of the lake (average depth 3.9 feet) the bottom waters probably remain oxygenated by mixing due to wind, regardless of the Secchi depth.

SUMMARY AND RECOMMENDATIONS

Summary

Potomac Lake, a small, shallow recreational impoundment in northeastern Illinois, was sampled on twelve dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Curt Contreras recorded Secchi discs transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Potomac Lake (19.1 inches) ranked 65th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health and was in the range generally associated with use impairment problems for Illinois lakes.

Potomac Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from urban storm drainage, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, and improve fishing. Harvesting of aquatic weeds or use of screens might also be considered.

Continued monitoring is recommended for Potomac Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3871C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

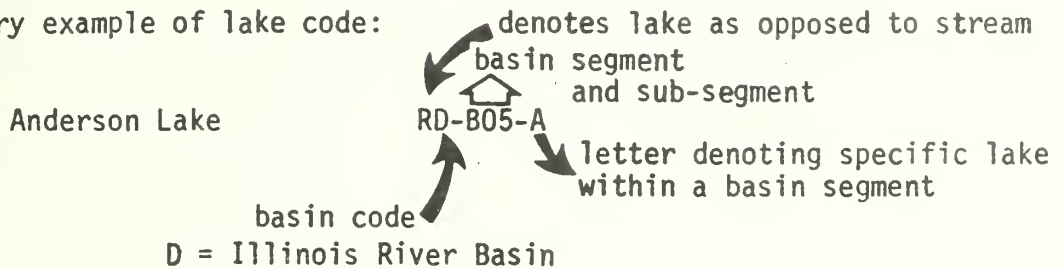
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

DS:sp,6207a,1-8

UNIVERSITY OF ILLINOIS-URBANA
551.482V889X C002
VOLUNTEER LAKE MONITORING PROGRAM SPRIN
1981:58



3 0112 017525871

551.482
V889X
1981:57
cup. 2

Nat. Hist. Surv

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706



1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY
AUG 25 1982
10010V



POHLMAN SLOUGH / CALHOUN Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
POHLMAN SLOUGH, CALHOUN COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Pohlman Slough is a 95-375 acre backwater of the Illinois River, located 4 miles southeast of Brussels, in Calhoun County, Illinois. The slough, which is managed by the Illinois Department of Conservation (IDOC), has a maximum depth of approximately 4 feet and an average depth of 2.5 feet (Table 1). Pohlman Slough is one of a number of interconnecting backwaters. Surface area and storage capacity estimates vary greatly depending on the river stage and how the boundaries are defined.

Pohlman Slough serves as a recreational lake. Major uses associated with it include rowboating or canoeing, picnicking, waterfowl observation, and fishing. Access is free. IDOC maintains a boat launch area. Numerous picnic tables and fishing spots dot the shoreline. The lake shoreline is also primarily wooded.

Suspended sediment, deposition of sediment, and aquatic weeds (duckweed) are considered substantial problems for Pohlman Slough, while algal blooms are considered moderate problems. Sediment in the lake, outboard motors, septic systems and discarded beverage containers are cited as potential pollution sources. High turbidity is partially caused by carp, especially during spawning season.

TABLE 1. LAKE ASSESSMENT SUMMARY, POHLMAN SLOUGH, CALHOUN COUNTY, ILLINOIS (UD-B06-A).

I. GENERAL INFORMATION

River Basin: Illinois
Segment: B06

Ownership: Managed by IL Dept. of Conservation Region V
Alton, IL

** Surface Area (Acres): 350-400 (95*)
Watershed Area (Acres): none
Maximum Depth (Feet): 4 (5.0*)
Average Depth (Feet): 2½ (3.0*)
** Storage Capacity (Acre/Feet): 937.5 (285*)
Inflowing Stream(s): none
Outflowing Stream(s): none
Water Retention Time:
Lake Type: River backwater
Year Constructed: na

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation: very heavy
Fishing: very heavy
Swimming: none
Power Boating: light
Row Boating or Canoeing: moderate
Sailboating: none
Camping: none
Picnicking: very heavy
Waterfowl Hunting: none
Waterfowl Observation: moderate
Other:

Recreational Facilities:
boat launch, many waters edge picnic
units, rest-rooms.

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns):
Golf Courses:
Pasture or Grassland:
Woodland: 90%
Row Crops:
Wetland: 10%
Other:

Watershed Usage (Percent):

Urban:
Residential:
Golf Courses:
Pasture or Grassland:
Woodland: 50%
Row Crops: 30%
Wetland: 20%
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair

Fishing: poor

Conditions and Extent:

Suspended Sediment: large - turbidity high all year
Deposition of Sediment: large
Algal Blooms: moderate
Aquatic Weeds: large (duckweed)
Taste and/or Odor: slight
Water Level Fluctuation: minimal
Fishkills: slight
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks:
Pasture or Grassland Runoff:
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from
Lawns/Golf Courses:
Orchards: yes
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake: yes
Other: Outboard motors; summer cabins; discarded
beverage containers; carp.

V. LAKE MANAGEMENT

Comments: _____

Information Supplied By Mr. Robert Freeman (1981); * Illinois Department of Conservation (1977).

** Note: Pohlman Slough is one of a number of interconnecting backwaters. Surface area estimates vary greatly depending on how the boundaries are defined and the river stage.

Assessment information on Pohlman Slough was provided by Robert Freeman and the Illinois Department of Conservation. Monitoring was performed by Robert Freeman and Ken Freeman. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Figure 1) on seven dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Pohlman Slough are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3 while field observations are summarized in Table 4.

Transparency of Pohlman Slough

The average Secchi disc transparency of Pohlman Slough was 7.9 inches, which ranked number 86 when the average transparencies of the lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Spatial and Seasonal Differences in Transparency

Secchi disc measurements for Pohlman Slough ranged from a minimum of 6 inches at all sites on several dates to a maximum of 12 inches at Sites 1 and 2 on May 17.

Clarity was relatively uniform at all three sites. The average transparencies were 8.0 inches at Site 1 and 7.9 inches at Sites 2 and 3. The low Secchi readings at the sites were probably related to the shallow depths, which allowed resuspension of bottom sediment by wind and wave activity.

Pohlman Slough was extremely turbid throughout the May-September sampling. Brown water color and large amounts of suspended sediment were noted at all three sites throughout the sampling period.

FIGURE 1
POHLMAN SLOUGH
CALHOUN COUNTY

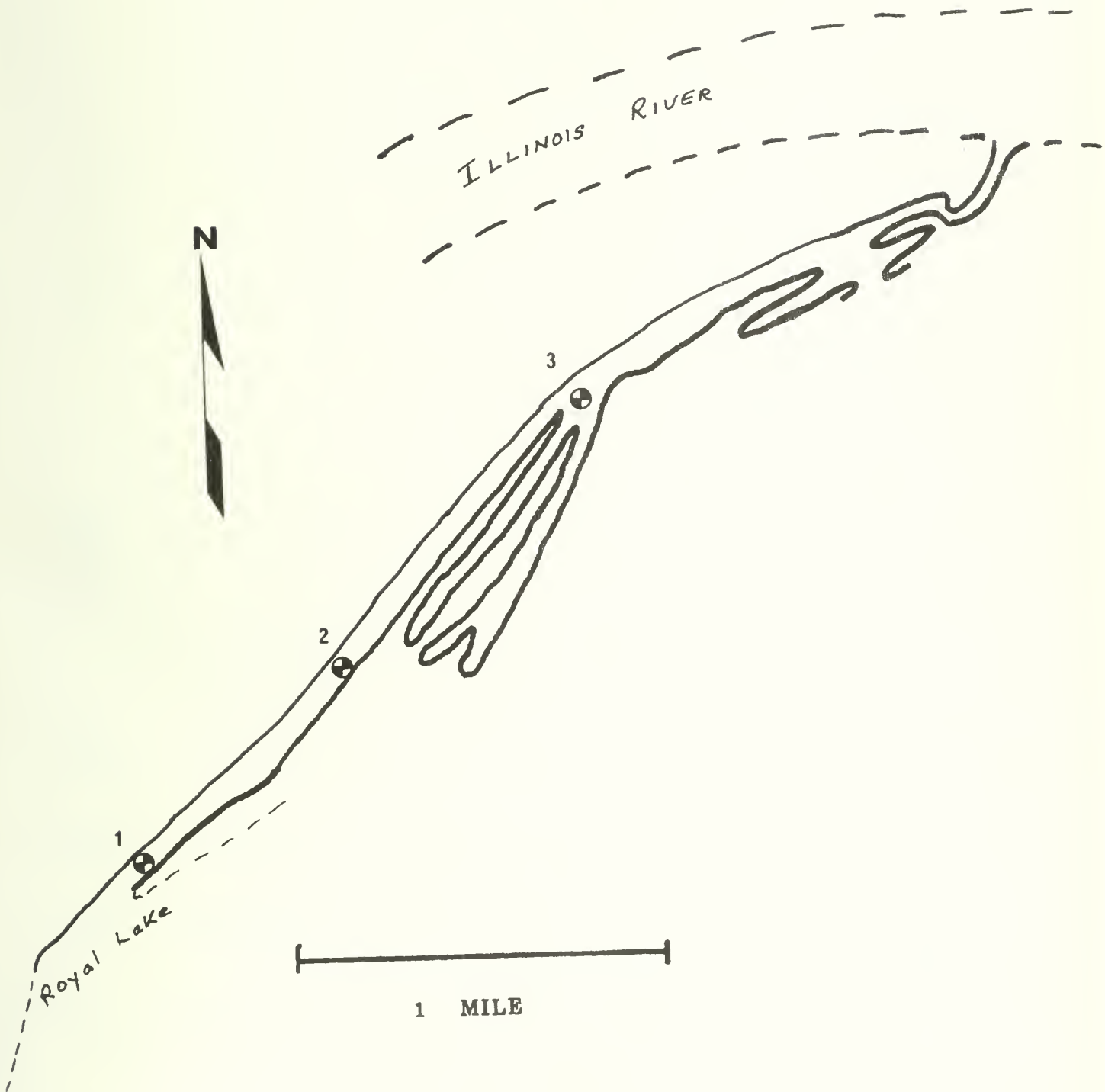


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) POHLMAN/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/17	12.0	12.0	11.0	11.7	0.6
06/06	12.0	11.0	10.0	10.3	0.6
06/28	6.0	6.0	6.0	6.0	0.0
08/14	8.0	8.0	8.0	8.0	0.0
08/20	6.0	6.0	6.0	6.0	0.0
09/12	8.0	6.0	8.0	7.3	1.2
09/27	6.0	6.0	6.0	6.2	0.0

SUMMARY STATISTICS

SITES	LAKE
MEAN	8.0
STD DEV	2.3
MIN	6.0
MAX	12.0
AV DEPTH	3.1

-1 = missing value

See glossary for explanation of Summary Statistics

TABLE 3

DEPTH OF SITE (FEET) POHLMAN/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/17	3.0	4.0	3.0	3.3	0.6
06/06	3.0	4.0	3.0	3.3	0.6
06/28	5.0	5.5	5.0	5.2	0.3
08/14	2.5	3.0	3.0	2.8	0.3
08/20	3.0	3.5	3.0	3.2	0.3
09/12	3.0	3.0	3.0	3.0	0.0
09/27	2.0	3.0	2.5	2.5	0.5

SUMMARY STATISTICS

SITES	LAKE
MEAN	3.1
STD DEV	0.9
MIN	2.0
MAX	5.5
AV DEPTH	3.1

-1 = missing value

See glossary for explanation of Summary Statistics

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) POHLMAN/CALHOUN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

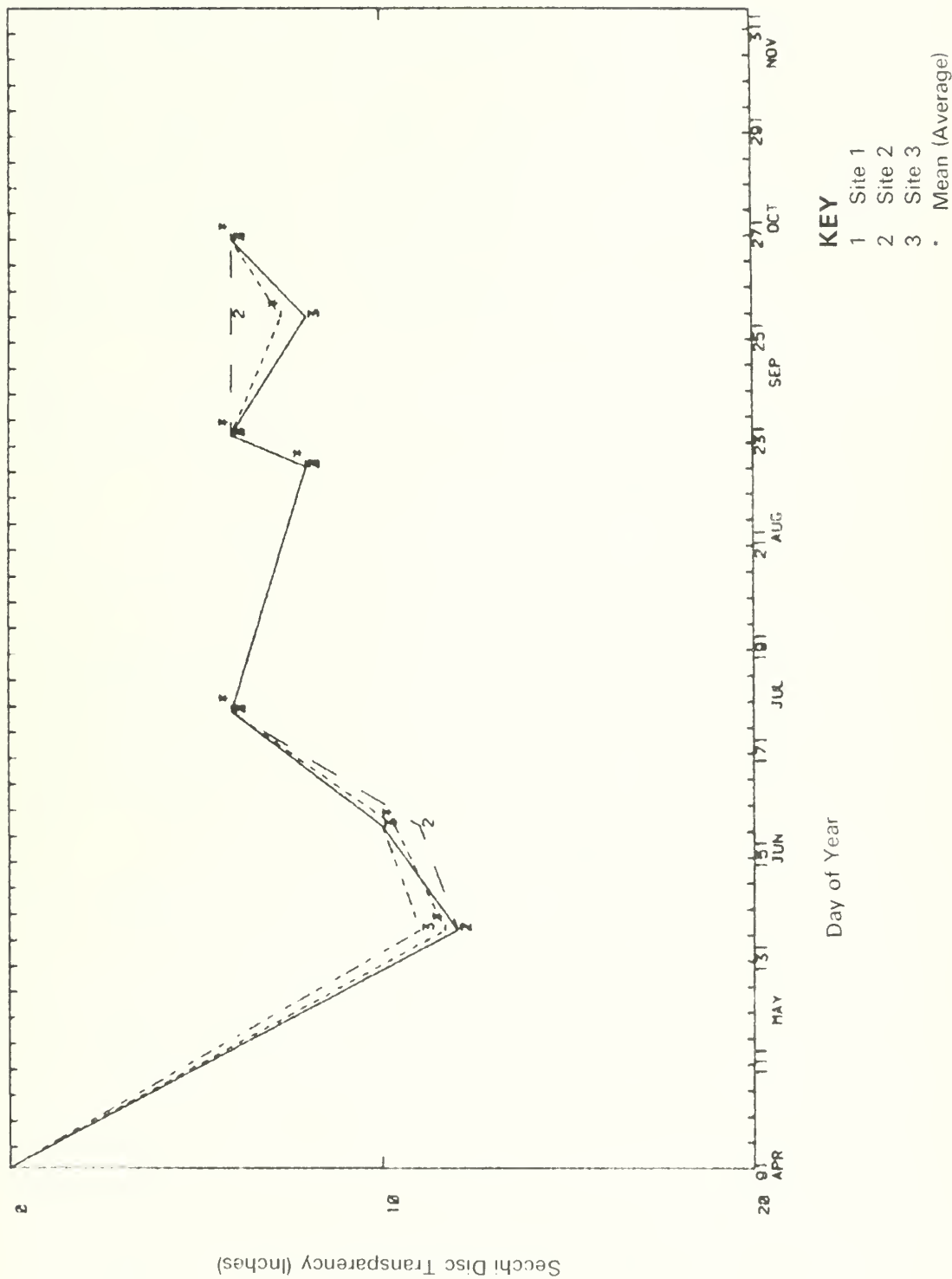


TABLE 4 FIELD OBSERVATIONS, FISH HATCHERY, HANCOCK COUNTY, ALABAMA

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
1/1/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal minimal *	lt. brown large slight minimal minimal duckweed *	lt. brown large slight minimal minimal duckweed *	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast v. lt. rain calm warm W	clear no rain calm warm W	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY: Robert H. Freeman Ken Freeman			

*cans, bottles, plastics

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal minimal *	lt. brown large slight minimal minimal duckweed *	lt. brown large slight minimal minimal duckweed *	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain ripple warm S	hazy no rain ripple warm S	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY: Robert H. Freeman Ken Freeman			

*cans, bottles, plastics

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	very brown large minimal minimal minimal *	very brown large minimal minimal minimal *	very brown large minimal minimal minimal *	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot N	clear no rain ripple hot N	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY: Robert H. Freeman Ken Freeman			

*beverage containers

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal moderate none	lt. brown large minimal minimal moderate oil films *	lt. brown large minimal minimal moderate oil films *	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot S	clear no rain calm hot S	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
		no odor	no odor	no odor	OBSERVATIONS MADE BY: Robert H. Freeman Ken Freeman			

*beverage containers

TABLE 4. FIELD OBSERVATIONS, FOHLMAN SLOUGH, CALHOUN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal moderate none no odor	lt. brown large minimal minimal moderate oil films no odor	lt. brown large minimal minimal moderate oil films no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm north Ken & Robert Freeman	clear no rain calm warm north	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, 3 boats 3 people. LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
*Beverage Containers								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal slight * no odor	pea soup large moderate minimal slight * ** fishy	grn-brn large slight minimal slight * ** fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain ripple hot N Robert H. Freeman Ken Freeman	few clouds no rain ripple hot N	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, picnicking LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
*beverage containers **oil films, algal col.								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/27/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown large minimal minimal slight none no odor	pea soup large moderate slight slight * no odor	grn-brn large slight slight slight * no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	hazy no rain ripple cool Robert H. Freeman Ken Freeman	overcast heavy rain moderate warm NE	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, pecan nut gathering LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
*oil films, algal col., waterfowl, beverage containers								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Pohlman Slough (estimated at twice the Secchi depth) ranged from 1.0-2.0 feet at Sites 1 and 2, and from 1.0-1.8 feet at Site 3. Since Pohlman Slough is so shallow, the bottom waters probably contain sufficient amounts of dissolved oxygen from mixing due to wind and wave activity.

SUMMARY AND RECOMMENDATIONS

Summary

Pohlman Slough, a very shallow backwater of the Illinois River in south-central Illinois, was sampled on seven dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Robert and Ken Freeman recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Pohlman Slough (7.9 inches) ranked 86th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems for Illinois lakes.

Transparency was similar at the three sites and little seasonal variation in clarity was noted. Field observations of a brown water color and large amounts of suspended sediment throughout the sampling indicated that the transparency was influenced primarily by sediment.

Recommendations

Continued monitoring is recommended for Pohlman Slough. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

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- Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.
- DS:jab/sp4563C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

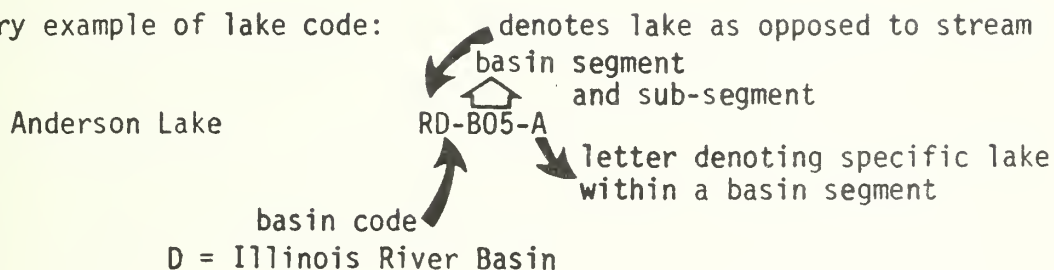
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

DS:sp,6207a,1-8

UNIVERSITY OF ILLINOIS-URBANA
551.482V889X C002
VOLUNTEER LAKE MONITORING PROGRAM SPRIN
1981:57



3 0112 017525863

551.482
V889X
1981.56
cop. 2

Nat. Hist. Surv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706



NATURAL HISTORY SURVEY
AUG 2: 1982

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT



PINCKNEYVILLE CITY RESERVOIR | PERRY Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
PINCKNEYVILLE CITY RESERVOIR, PERRY COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of a self-help service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Pinckneyville City Reservoir is a 165 acre lake owned by the City of Pinckneyville in Perry County, Illinois. The impoundment, which was constructed in 1945 by damming Oppossum Creek, has a maximum depth of 30 feet, an average depth of 12 feet, and a storage capacity of 1980 acre-feet (Table 1).

Pinckneyville City Reservoir serves as a potable and industrial water supply for the City. Recreational use (primarily fishing, boating, and waterfowl hunting) is light. Access is unlimited and free.

The 3051 acre drainage area of Pinckneyville City Reservoir is estimated to be 96 percent woodland. The lake shoreline is also primarily wooded.

Aquatic weeds and water level fluctuations are considered to be moderate problems for the reservoir. Septic tanks and pasture, grassland, and cropland runoff are cited as potential pollution sources.

Assessment information for Pinckneyville City Reservoir was provided by Water Treatment Plant Operator Don Wilkin and the Illinois Department of Conservation. Monitoring was performed by Bob Logan. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Figure 1) on 13 dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, Pinckneyville City Reservoir, Perry County, Illinois (RN-A04-H).

I. GENERAL INFORMATION

River Basin: Big Muddy
Segment: A04

Ownership: City of Pickneyville

Surface Area (Acres): 165*
Watershed Area (Acres): 3051*
Maximum Depth (Feet): 30
Average Depth (Feet): 12*
Storage Capacity (Acre/Feet): 1980*
Inflowing Stream(s): Oppossum Creek
Outflowing Stream(s): Oppossum Creek
Water Retention Time: 0.649 year
Lake Type: dammed stream
Year Constructed: 1945

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: moderate
Industrial Water Supply: moderate
Agricultural Water Supply: light
Cooling Water: none
Recreation: light
Fishing: light
Swimming: none
Power Boating: none
Row Boating or Canoeing: light
Sailboating: light
Camping: none
Picnicking: none
Waterfowl Hunting: light
Waterfowl Observation: none
Other: Cabin 2%

Recreational Facilities:

boat launch

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns):
Golf Courses:
Pasture or Grassland:
Woodland: 98%
Row Crops:
Wetland:
Other:

Watershed Usage (Percent):

Urban:
Residential:
Golf Courses:
Pasture or Grassland: 3
Woodland: 96
Row Crops:
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent
Fishing: fair

Conditions and Extent:

Suspended Sediment: minimal
Deposition of Sediment: minimal
Algal Blooms: slight
Aquatic Weeds: moderate
Taste and/or Odor: slight
Water Level Fluctuation: moderate
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks: yes
Pasture or Grassland Runoff: yes
Cropland Runoff: yes
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from
Lawns/Golf Courses:
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake:
Other: wildlife

V. LAKE MANAGEMENT

Comments: _____

Information Supplied By Don Wilkin (1981) *Illinois Department of Conservation (1977).

FIGURE 1

PINCKNEYVILLE LAKE

PERRY COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Pinckneyville City Reservoir are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Pinckneyville City Reservoir

The average transparency of Pinckneyville City Reservoir was 38.2 inches, which ranked number 42 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

A lengthy drought preceded the 1981 sampling and the water level of Pinckneyville City Reservoir was eight feet below normal in late April and early May. The water level did not return to normal until late June after heavy rains had occurred in the Pinckneyville area. Rainfall was above normal during the sampling period; thus the transparencies recorded may have been below normal.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Lake Pinckneyville ranged from a minimum of 13 inches at Site 3 on May 30 to a maximum of 60 inches at all three sites on July 7 and August 4.

Secchi readings were below the four feet minimum recommended for swimming on seven of the thirteen sampling days at Site 1 and on nine of the thirteen days at Sites 2 and 3.

Average transparencies of Sites 1, 2, and 3 on Pinckneyville City Reservoir were 40.2 inches, 37.8 inches and 36.5 inches, respectively. On some sampling dates, Site 1 was noticeably clearer than Site 3; while on other dates, the transparency of Sites 1 and 3 were similar. Generally, however, larger amounts of algae and sediment were noted at Site 3.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) PICKNEYVILLE/PERRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 30	24.0	22.0	13.0	10.7	5.0
05/ 12	18.0	24.0	15.0	19.0	4.6
05/ 28	24.0	20.0	26.0	23.3	3.1
06/ 11	48.0	48.0	48.0	48.0	0.0
06/ 23	42.0	36.0	24.0	34.0	0.2
07/ 7	60.0	60.0	60.0	60.0	0.0
07/ 21	48.0	36.0	36.0	40.0	6.0
08/ 4	60.0	60.0	60.0	60.0	0.0
08/ 28	48.0	60.0	36.0	48.0	6.0
09/ 2	48.0	48.0	48.0	48.0	0.0
09/ 20	36.0	36.0	36.0	36.0	0.0
10/ 14	30.0	24.0	30.0	28.0	3.5
10/ 20	36.0	42.0	42.0	40.0	3.5

SUMMARY STATISTICS

SITES		LAKE
MEAN	40.2	37.8
STD DEV	13.3	13.5
MIN	18.0	13.0
MAX	60.0	60.0
AV DEPTH	21.5	16.2

-1 = missing value

See glossary for explanation of Summary Statistics

TABLE 3

DEPTH OF SITE (FEET) PICKNEYVILLE/PERRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 30	15.0	18.5	5.0	10.2	5.0
05/ 12	17.0	0.5	5.0	10.5	6.1
05/ 28	20.0	13.0	13.0	15.3	4.0
06/ 11	22.0	17.0	11.5	16.8	5.3
06/ 23	22.0	10.0	13.0	19.0	4.6
07/ 7	25.0	17.0	11.0	17.7	7.0
07/ 21	21.0	10.0	12.0	17.3	4.7
08/ 4	23.0	17.0	12.0	17.3	5.5
08/ 28	23.0	10.0	11.0	17.3	6.0
09/ 2	25.0	10.0	10.0	16.3	7.0
09/ 20	22.0	17.0	10.0	16.7	6.0
10/ 14	22.0	18.0	10.0	16.7	6.1
10/ 20	23.0	17.0	10.0	16.7	6.5

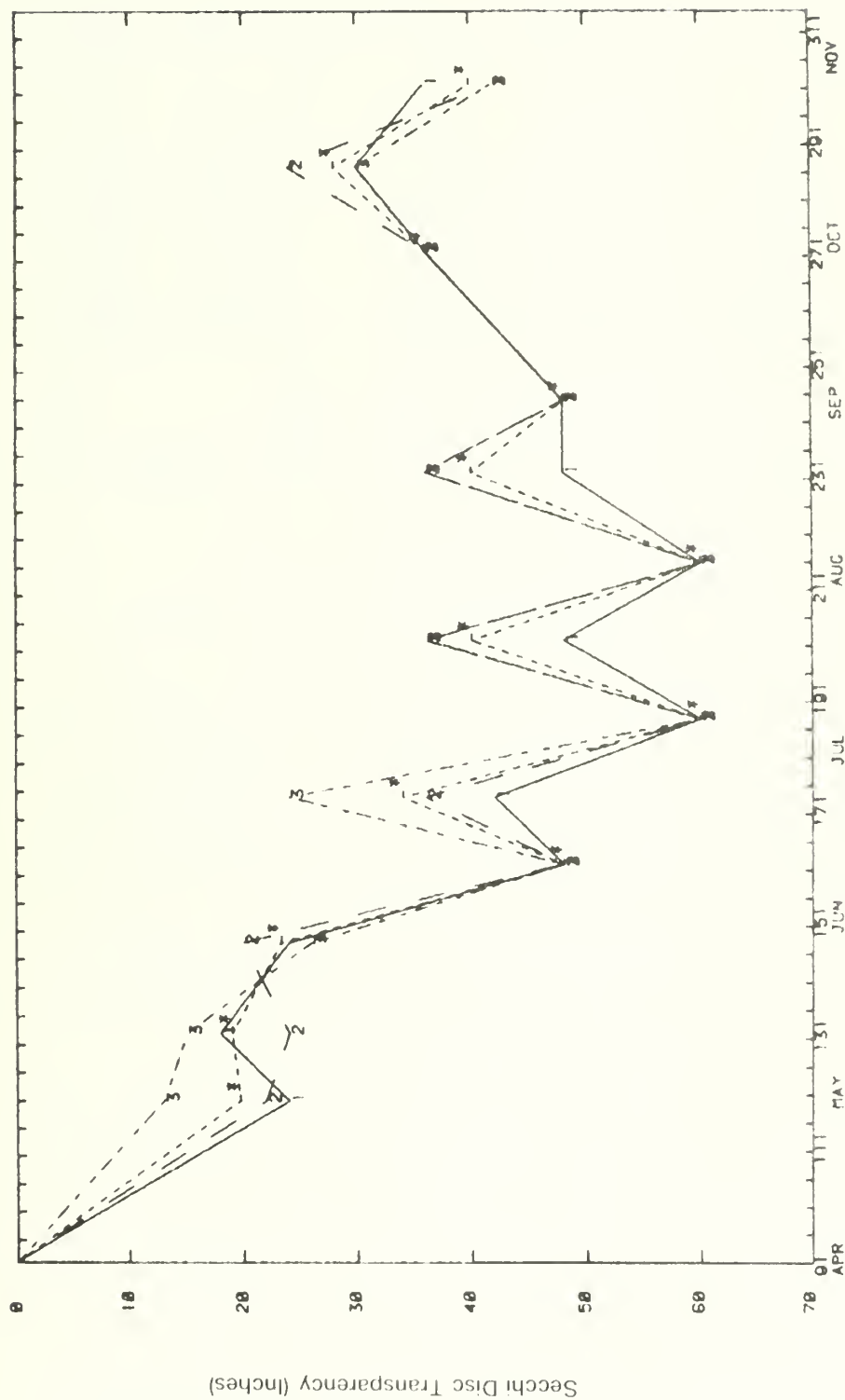
SUMMARY STATISTICS

SITES		LAKE
MEAN	21.6	16.2
STD DEV	2.8	10.3
MIN	15.0	2.6
MAX	25.0	5.0
AV DEPTH	21.6	25.0

-1 = missing value

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) PICKNEYVILLE/PERRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY
 1 Site 1
 2 Site 2
 3 Site 3
 . Mean (Average)

Day of Year

TABLE 4. FIELD OBSERVATIONS, PICKNEYVILLE, PERRY COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
4/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown slight minimal minimal slight none no odor	lt. brown slight minimal minimal slight none no odor	mod. brown moderate minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain small warm N	overcast v. lt. rain small warm NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: Bob Logan			
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn minimal minimal minimal minimal none no odor	grn-brn minimal minimal minimal slight none no odor	mod. brown moderate minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple cool S	many clouds lt. rain moderate cool NA	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: B. J. Logan			
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn minimal minimal slight none no odor	grnsh-brn slight minimal moderate none no odor	grnsh-brn moderate moderate slight moderate lily pads no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain ripple warm SW	many clouds no rain ripple warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: B. J. Logan			Lake has risen several feet in last week.
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/11/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate slight none no odor	brnsh-grn moderate moderate moderate lily pads odor	brnsh-grn moderate moderate moderate lily pads dec. fish no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds v. lt. rain calm warm S	many clouds no rain ripple hot S	WATER LEVEL OF LAKE: RECREATIONAL USAGE: fishing, 10hp or less LAKE MANAGEMENT: ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: B. J. Logan			below normal 12' fishing, boat

TABLE 4. FIELD OBSERVATIONS, PIUCKNEYVILLE, PERRY COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE			WEATHER AT LAKE		PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT			
5/23/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate slight minimal none	brnsh-grn moderate moderate moderate moderate none	brnsh-grn moderate moderate moderate moderate none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple warm W	many clouds no rain ripple warm S	WATER LEVEL OF LAKE: above normal RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

*small twigs, small leaves, cottonwood seeds

DATE	OBSERVATION	SITE			WEATHER AT LAKE		PRECEDING 24 HOURS		OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT				
7/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn slight slight minimal moderate none no odor	grnsh-brn slight slight minimal moderate none no odor	grnsh-brn slight slight large large lily pads no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: B. J. Logan	few clouds no rain moderate hot W	many clouds lt. rain moderate hot NW	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/4/81	WATER COLOR; SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES:	grnsh-brn moderate slight slight slight none	grnsh-brn moderate moderate moderate moderate algal mats	grnsh-brn moderate moderate moderate moderate none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain calm warm	overcast v. lt. rain calm warm NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor	OBSERVATION MADE BY: B. J. Logan			

TABLE 4. FIELD OBSERVATIONS, PIRCKNEYVILLE, PERRY COUNTY, ILLINOIS.

DATE	OBSERVATION	WEATHER AT LAKE			PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT	
8/20/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight minimal minimal moderate none no odor	brnsh-grn slight minimal minimal large none no odor	brnsh-grn slight minimal slight large none no odor	few clouds no rain ripple warm NW OBSERVATIONS MADE BY: B. J. Logan	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	WEATHER AT LAKE			PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT	
9/2/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn slight minimal minimal moderate none no odor	grnsh-brn slight slight slight moderate none no odor	grnsh-brn slight slight slight large none no odor	overcast no rain ripple warm NW OBSERVATIONS MADE BY: B. J. Logan	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	WEATHER AT LAKE			PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT	
9/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn minimal minimal minimal minimal none no odor	grnsh-brn minimal minimal minimal slight none no odor	grnsh-brn slight minimal moderate moderate none no odor	clear no rain calm cool E OBSERVATIONS MADE BY: B. J. Logan	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	WEATHER AT LAKE			PRECEDING 24 HOURS	OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT	
10/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal slight none no odor	mod. green minimal minimal minimal moderate none no odor	mod. green minimal minimal moderate large lilly pads no odor	overcast v. lt. rain small cool N.W. OBSERVATIONS MADE BY: Bob Logan	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight slight minimal none no odor	mod. green slight slight slight none no odor	mod. green moderate moderate moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Bob Logan	few clouds no rain ripple cool S.	few clouds no rain ripple cool S.	WATER LEVEL OF LAKE: RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

-10-

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

There were seasonal differences in the transparency of Pinckneyville City Reservoir. The lowest transparencies were generally recorded in mid spring; a brownish water color at that time indicated that transparency was influenced primarily by suspended sediment. At other times, a brownish-green to moderately green water color indicated that transparency was also influenced by algae. Uniform amounts of algae and suspended sediment were noted on most sampling dates. Moderate amounts of aquatic weeds were observed at Sites 2 and 3; this may reflect the shallow nature of the sites and/or the occurrence of nutrient input in the vicinity.

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Pinckneyville City Reservoir (estimated at twice the Secchi depth) ranged from 3.0-10.0 feet at Site 1, 3.3-10.0 feet at Site 2, and 2.2-10.0 feet at Site 3. Since Pinckneyville City Reservoir is deep enough to thermally stratify and had an euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during spring and fall mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Pinckneyville City Reservoir, a medium-sized public water supply impoundment in southern Illinois, was sampled on 13 dates between May 30 and October 31, 1981 under the Illinois EPA's Volunteer Lake

Monitoring Program. Volunteer Bob Logan recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Pinckneyville City Reservoir (38.2 inches) ranked 42nd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses. Above normal rainfall during the sampling period may have contributed to lower than normal transparencies.

Lowest transparencies were recorded in mid-spring; a brownish water color at that time indicated that transparency was influenced primarily by suspended sediment. At other times, a brownish-green to moderately green water color indicated that algae also influenced transparency. There were variations in transparency at all sites; but generally large amounts of sediment and algae were observed at Site 3. Aquatic weed problems were noted at Sites 2 and 3.

Since Pinckneyville City Reservoir is deep enough to thermally stratify and the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems and limitation of fish habitat may be expected during summer stratification.

Pinckneyville City Reservoir is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment inputs were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems. Since the watershed of Pinckneyville City Reservoir is primarily wooded, the source areas of sediment and nutrients are probably small and easily identified.

Installation of agricultural Resource Management Systems in identified source areas of the watershed, particularly those closest to the lake, may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata of the lake for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, alleviate taste and odor problems, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Pinckneyville City Reservoir. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

REFERENCES

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DS:jab/sp3891C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

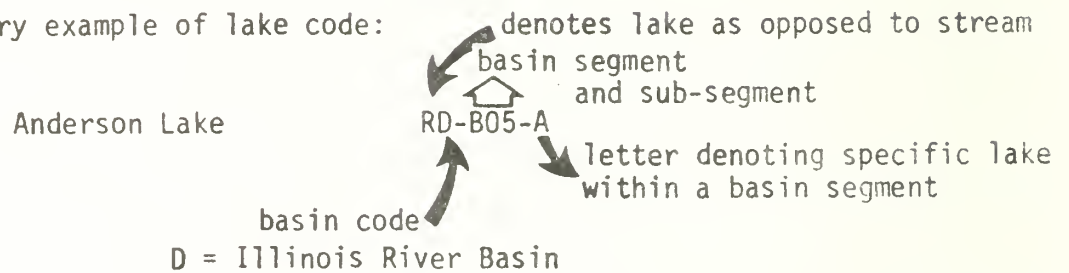
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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